

**Work Order ID 124781**

Tuesday, September 23, 2014 1:47:01 PM

**\*124781\***

Page 1

Item ID: D412-664-203TRN

Accept

**\*N9000040100\***

Setup Start

**\*NS1\***

Revision ID:

Stop

**\*NS2\***

Item Name: Crosstube Turning Detail

Start Date: 9/23/2014 Start Qty: 1.00

**\*1\***

Cust Item ID:

Required Date: 9/23/2014 Req'd Qty: 1.00

**\*1\***

Customer:

Reference:

Approvals: Process Plan: MLJDate: 14-09-23

Tooling:

Date:

Run Start

**\*NR1\***

QC:

Date:

SPC (Y/N):

Date:

Stop

**\*NR2\***

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
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Draw Nbr

Revision Nbr

D412-664-243

F

100

0.00

**\*100\***

MORI SEIKI CNC LATHE LARGE

Mori Seiki

Memo

0.00

Mori Seiki CNC Lathe Large

1-Fill tube with sand &amp; install plugs DT8534 on both ends as per Folio FA166

2-Turn first side as per Folio FA166

3- File transition lines smooth.

FOLIO REV: AADWG REV: D

110

QC1- Inspect dimensions to dimension sheet

0.00

**\*110\***

QC

Memo

0.00

Quality Control

man L  
14/09/30

man L  
14/09/30

# Work Order ID 124781

Tuesday, September 23, 2014 1:47:01 PM

**\*124781\***

Page 2

Item ID: D412-664-203TRN

Accept

**\*N900040100\***

Setup Start **\*NS1\***

Revision ID:

Stop **\*NS2\***

Item Name: Crosstube Turning Detail

Start Date: 9/23/2014 Start Qty: 1.00 **\*1\***

Cust Item ID:

Required Date: 9/23/2014 Req'd Qty: 1.00 **\*1\***

Customer:

Reference:

Approvals: Process Plan: \_\_\_\_\_ Date: \_\_\_\_\_ Tooling: \_\_\_\_\_ Date: \_\_\_\_\_  
QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Run Start **\*NR1\***

Stop **\*NR2\***

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
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120

**\*120\***

Mori Seiki

Mori Seiki CNC Lathe Large

MORI SEIKI CNC LATHE LARGE

**Memo**

1-Turn second side as per Folio FA166  
2- File transition lines smooth.  
3- Remove sand and plugs  
4-Scribe part # and batch # using vibrating stilus  
FOLIO REV: AB  
DWG REV: F

0.00

0.00

130

**\*130\***

QC

Quality Control

QC1- Inspect dimensions to dimension sheet

0.00

**Memo**

+ PERFORM ULTRA SONIC MEASUREMENT

0.00

140

**\*140\***

QC

Quality Control

QC8- Inspect parts - second check

0.00

**Memo**

+ CHECK ULTRA SONIC MEASUREMENT AND ORIENTATION FOR BENDING

0.00

1 0 *amr 1*  
14/10/01

1 0 *amr 2*  
14/10/01

*JW* 14-10-06



**Work Order ID 124781**

Tuesday, September 23, 2014 1:47:01 PM

**\*124781\***

Page 4

Item ID: D412-664-203TRN

Accept

**\*N900040100\***Setup Start **\*NS1\***

Revision ID:

Item Name: Crosstube Turning Detail

Stop **\*NS2\***

Start Date: 9/23/2014 Start Qty: 1.00

**\*1\***

Cust Item ID:

Required Date: 9/23/2014 Req'd Qty: 1.00

**\*1\***

Customer:

Reference:

Approvals: Process Plan: \_\_\_\_\_ Date: \_\_\_\_\_ Tooling: \_\_\_\_\_ Date: \_\_\_\_\_

Run Start **\*NR1\***

QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Stop **\*NR2\***

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
--------------------------------	--------------------------	----------------------	---------	--------	--------------	---------------	---------------	------------------	----------------

170

0.00

**\*170\***

Packaging

0.00

Packaging

Memo

Packaging

Identify and stock in kanban rack  
Location: LCJW 1410-07

180

0.00

**\*180\***

QC21- Final Inspection - Work Order Release

0.00

QC

Memo

Quality Control

14/10/8 JD14-10-08

# Picklist Print

Tuesday, September 23, 2014 1:47:04 PM

Page 1

Work Order ID: 124781

**\*124781\***

Parent Item: D412-664-203TRN

**\*D412-664-203TRN\***

Parent Item Name: Crosstube Turning Detail

Start Date: 9/23/2014

Required Date: 9/23/2014

Start Qty: 1.00

Required Qty: 1.00

Comments: IPP Rev:A 08-03-06 new issue DD verified by:cec  
IPP Rev B 08.04.02 Removed polish EC verified by: DD

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Qty per Kit	Total Qty	Qty Issued	Date Issued	Status
D6009-129		Manufactured	No			120	Each	40.5000	1	1			

**\*D6009-129\***

Crosstube Material

**\*\***

Location

Loc Qty

Loc Code

LG003

40.5

107864

36.5

75627

3

75648

1

1

mmh 14/09/26

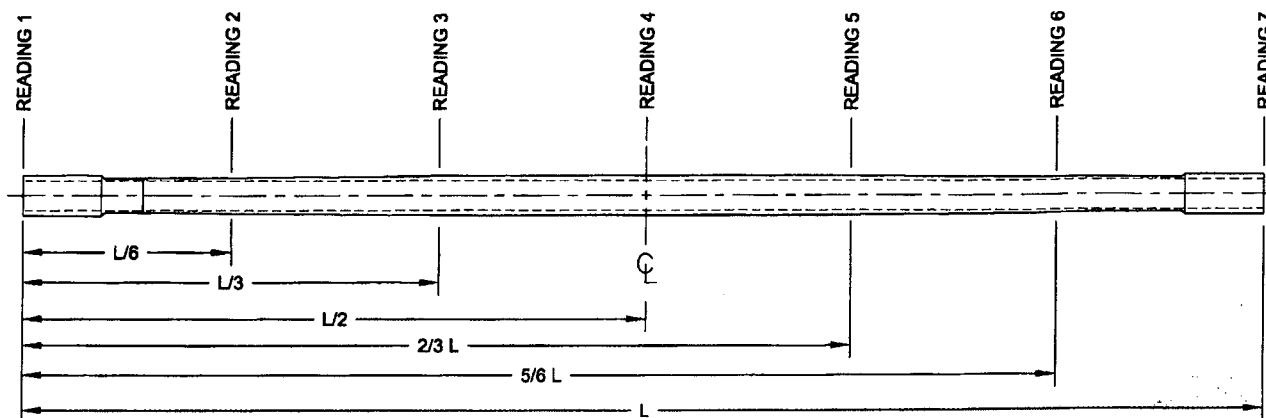
<b>DART AEROSPACE LTD</b>	<b>Work Order:</b> 124781
<b>Description: Crosstube Assembly (412 High Aft)</b>	<b>Part Number:</b> D412-664-243
<b>Inspection Dwg: D412-664-243 Rev: F</b>	<b>Page 1 of 2</b>

### FIRST ARTICLE INSPECTION CHECKLIST

	Inspection Sheet Drawing Dimension	Tolerance	Actual Dimension	Accept	Reject	Method of Inspection	Comments
SIDE A	2.684	+0.005/-0.000	2.688	-		vern	CNC-08
	2.748	+0.005/-0.000	2.752	-			
	2.884	+0.005/-0.000	2.888	-			
	3.019	+0.005/-0.000	3.024	-			
	3.163	+0.005/-0.000	3.168	-			
	3.308	+0.005/-0.000	3.312	-			
	3.429	+0.005/-0.000	3.432	-			
	2.990	+0.005/-0.000	2.992	-			
	2.618	+0.005/-0.000	2.622	-			
	0.200	+/-0.010	.200	-		vern	CNC-08
	R0.063	+/-0.010	.063	-		RG	
	R0.500	+/-0.010	.500	-		II	
	4.971	+/-0.030	4.970	-		vern	CNC-08
SIDE B	2.684	+0.005/-0.000	2.688	-		vern	CNC-08
	2.748	+0.005/-0.000	2.753	-			
	2.884	+0.005/-0.000	2.889	-			
	3.019	+0.005/-0.000	3.024	-			
	3.163	+0.005/-0.000	3.167	-			
	3.308	+0.005/-0.000	3.312	-			
	3.429	+0.005/-0.000	3.432	-			
	2.990	+0.005/-0.000	2.992	-			
	2.618	+0.005/-0.000	2.623	-			
	0.200	+/-0.010	.200	-		vern	CNC-08
	R0.063	+/-0.010	.063	-		RG	
	R0.500	+/-0.010	.500	-		II	
	4.971	+/-0.030	4.970	-		vern	CNC-08
	124.100	+/-0.020	124.110	-		tape	2G-11

<b>DART AEROSPACE LTD</b>	<b>Work Order:</b> 124781
<b>Description:</b> Crosstube Assembly (412 High Aft)	<b>Part Number:</b> D412-664-243
<b>Inspection Dwg:</b> D412-664-243 <b>Rev:</b> F	<b>Page 2 of 2</b>

### WALL THICKNESS MEASUREMENT



Location	WALL THICKNESS MEASUREMENT (IN)				Deviation $\Delta w$ (max-min)	TOLERANCE
	w1	w2	w3	w4		
READING 1 L = 0"	.389	.385	.397	.404	.019	0.073"
READING 2 L = 20	.345	.317	.309	.338	.036	
READING 3 L = 42	.524	.507	.488	.502	.036	
READING 4 L = 62	.641	.641	.647	.647	.006	
READING 5 L = 82	.508	.516	.502	.496	.020	
READING 6 L = 104	.336	.325	.316	.329	.020	
READING 7 L = 124	.387	.374	.395	.409	.035	

#### Calibration Result

Actual Block Thickness: .100 - .750

Sitiescan 250 Measured Thickness: .100 - .750

<b>Measured by:</b> <i>mmk</i>
<b>Date:</b> 14/10/01

<b>Audited by:</b> <i>JW</i>
<b>Date:</b> 14-10-06

<b>Preliminary Approval:</b>
<b>Date:</b>

Rev	Date	Change	Revised by	Approved
A	04.06.16	New Issue (P/O D412-664-203)	KJ/JLM	
B	06.03.09	Dwg Rev updated	KJ/JLM	
C	07.05.08	Tolerance updated for dimension 4.971	KJ/JLM	
D	10.02.02	Dimension 124.100 was 124.09	KJ	
E	12.06.04	Wall thickness form added	KJ	
F	14.06.24	Dwg Rev updated	KJ	<i>[Signature]</i>

Item	Qty -243	Part Number	Description
1	X	D412-664-243	CROSSTUBE ASSEMBLY (412 HIGH AFT)
2	1	D6009-129	CROSSTUBE
3	2	D3595-063-570	RUBBER CUSHION
4	1	D2896-1	SUPPORT
5	2	D3189-1	CHAFING SHIELD
7	4	MS21920-28	CLAMP
8	2	MS21920-30	CLAMP (OR MS21920-32)
9	A/R	SCOTCH-WELD DP460	EPOXY ADHESIVE, 3M SCOTCH-WELD
10	A/R	PROSEAL 890 B-2	SEALANT

#### GENERAL NOTES:

- 1) MATERIAL: MANUFACTURED FROM D6009-129  
FINISHED LENGTH = 124.100±0.020 (BEFORE BENDING)
- 2) FINISH: CHEMICAL CONVERSION COAT PER DART QSI 005 4.1  
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2  
MASK UNDERSIDE OF CROSSTUBE AS SHOWN (ZN C6-2, HATCHED AREA)  
PAINT OUTSIDE PER DART QSI 005 4.2  
AFTER PAINTING, REMOVE MASKING AND APPLY MATTE CLEAR COAT
- 3) TOLERANCES: PER DART QSI 018 UNLESS OTHERWISE NOTED.
- 4) UNITS: INCHES UNLESS OTHERWISE NOTED.
- 5) BREAK SHARP EDGES: 0.005 TO 0.010 MAX.
- 6) IDENTIFICATION: DART P/N "D412-664-243" AND B/N ON INSIDE OF CUFF PER QSI 044 6.4 (VIBRATING STYLUS)
- 7) WEIGHT: 47.0 lbs
- 8) PART IS SYMMETRIC ABOUT CENTERLINE.
- 9) EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE. DO NOT GRIND TUBE AFTER SHOT PEEN.

#### TURNING

- 10) WHEN TRANSITIONING TO STOCK MAT'L, RUN CUTTER OFF PART. BLEND OUT EDGE LONGITUDINALLY. TRANSITION SHOULD BE SMOOTH.

#### BENDING

- 11) BEND PROGRESSIVELY WITH A MINIMUM OF 8 PASSES. MAXIMUM TUBE FLATTENING DUE TO BENDING IS 7% (BASED ON O.D.) IN LOWER HALF OF R30 BEND AND 6% (BASED ON O.D.) ON REMAINING TUBE.
- 12) LIQUID PENETRANT INSPECT OUTSIDE SURFACE OF CROSSTUBE PER QSI 038. TO BE PERFORMED AFTER FINAL POST-BEND GRINDING. ANY ADDITIONAL GRINDING REQUIRES ANOTHER LPI INSPECTION.

#### ASSEMBLY

- 13) INSTALL D2896-1 CENTER SUPPORT USING A 0.04" TO 0.07" THICK LAYER OF SCOTCH-WELD DP460 PER QSI 015.
- 14) INSTALL MS21920-30 CLAMPS (OR -32) WITH D3595-063-570 RUBBER CUSHIONS TO SECURE THE D2896-1 SUPPORT ON TOP SIDE OF THE CROSSTUBE. ENSURE CLAMPS ARE ON TOP SIDE OF CROSSTUBE.
- 15) APPLY A THIN COAT OF PROSEAL 890 ON INSIDE CONCAVE SURFACE OF D3189-1 CHAFING SHIELD AND LET CURE PER MANUFACTURER'S INSTRUCTIONS. INSTALL PROSEAL 890 ON INSIDE CONCAVE SURFACE OF D3189-1 CHAFING SHIELD ONTO CROSSTUBE BY APPLYING A THIN COAT OF PROSEAL 890 ONTO CROSSTUBE. BE SURE TO ELIMINATE ANY AIR GAPS.
- 16) TORQUE CLAMPS ON D2896-1 SUPPORT 80 TO 100 IN-LB. TORQUE CLAMPS ON D3189-1 CHAFING SHIELD 40 TO 50 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING. PRIOR TO PACKAGING, RE-CHECK TORQUE ON CLAMPS AFTER ADHESIVES HAVE CURED FOR 24 HOURS.

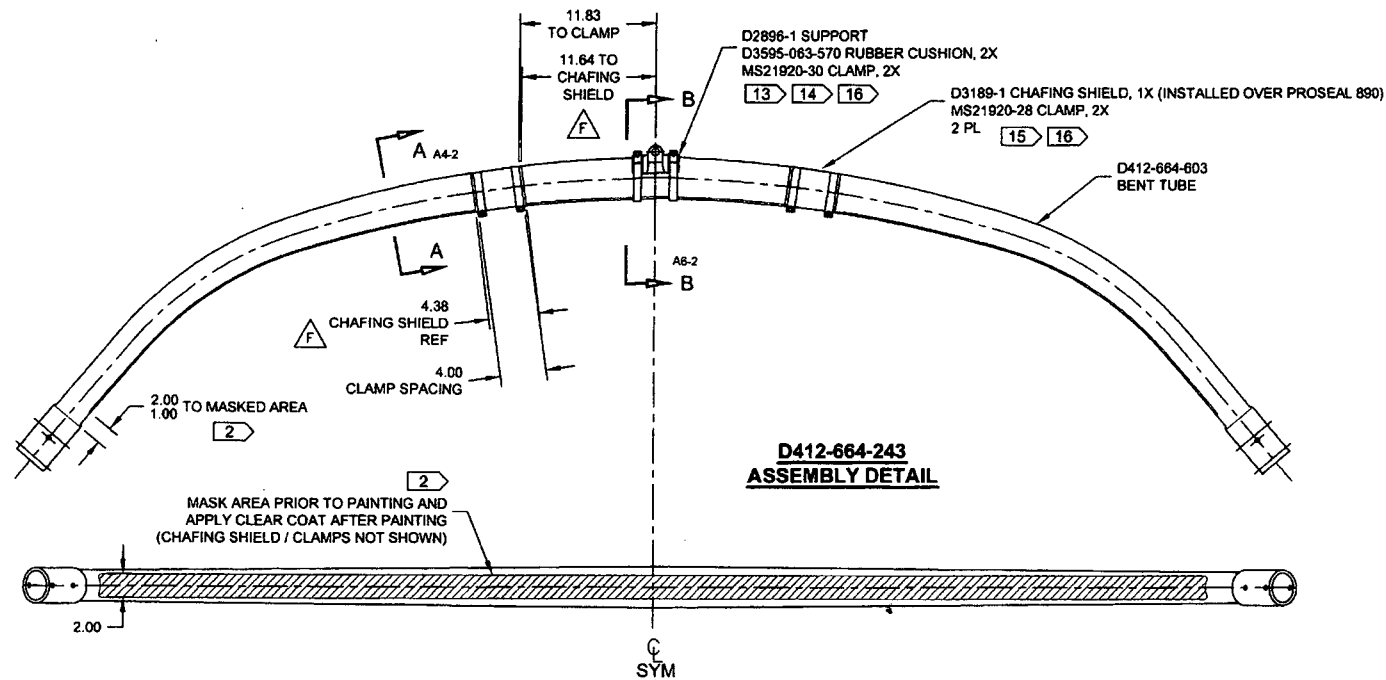
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SUBJECT TO AMENDMENT  
WITHOUT NOTICE  
WORK ORDER  
NO. 124781 MLJ

14-09-23

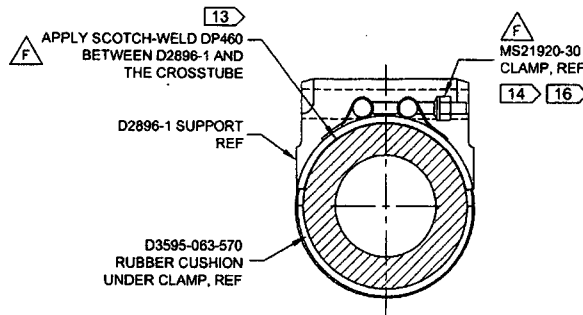
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2014-05-26

F	NOTES RE-ORDERED, SCOTCH-WELD WAS MAGNOBOND (C8-1), ADD CLAMP RETORQUE (A8-1), REMOVE ABRASION STRIP, ADD INSPECTION WINDOW (C8-1), CHAFING SHIELD NOW 4.38 WIDE (C6-2), ADD 7% CRUSHING (B8-1), CHG BEND HEIGHT TOL. TO ±0.25 (C1-3), CHG CUFF TOL. (D2-4), CLAMPS FLIPPED TO PREVENT CHAFING (B7-2, B7-3), INCORP. DEO E-244	CP	14.04.01
E	REFORMAT/REVISE GENERAL NOTES: REORGANIZED VIEWS AND REFORMATTED DRAWING TO CURRENT STANDARDS: RELOCATED FLAG #6 PER PAR 08-046 (ZN A8-3); ADD TOLERANCE (ZN B6-3, C4-3, C8-3 & C5-3); MOVED TURNING DETAIL & UPDATED TOLERANCE TO SHEET 4.	RF	09.09.30
D	REMOVE D2732-058, CHANGE TO D3595-063-570	PH	07.03.09
C	REMOVE D2856-600-1087, ADD D2732-058 & MAGNOBOND 6398, MS21920-32 WAS MS21920-30	MB	06.10.27
B	ADD HOLES FOR COMPATABILITY WITH BHT/AA SKIDTUBES	PH	05.02.04
A	NEW ISSUE	PH	01.10.17
REV.	DESCRIPTION	BY	DATE
DESIGN	DW	<b>DART AEROSPACE LTD</b> HAWKESBURY, ONTARIO, CANADA	
DRAWN	DW		
CHECKED	DW	DRAWING NO.	REV. F
MFG. APPR.	RA	D412-664-243	SHEET 1 OF 4
APPROVED	RA	TITLE	SCALE
DE APPR.	RA	CROSSTUBE ASSEMBLY (412 HI AFT)	NTS
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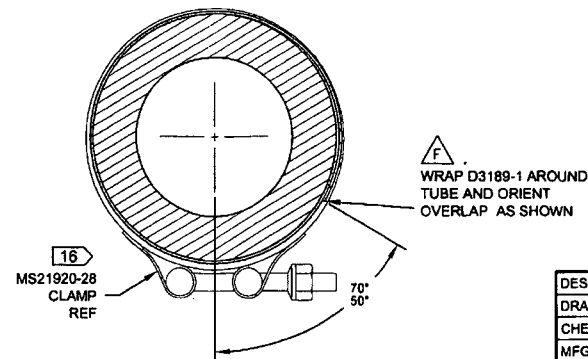




**D412-664-243  
ASSEMBLY DETAIL**



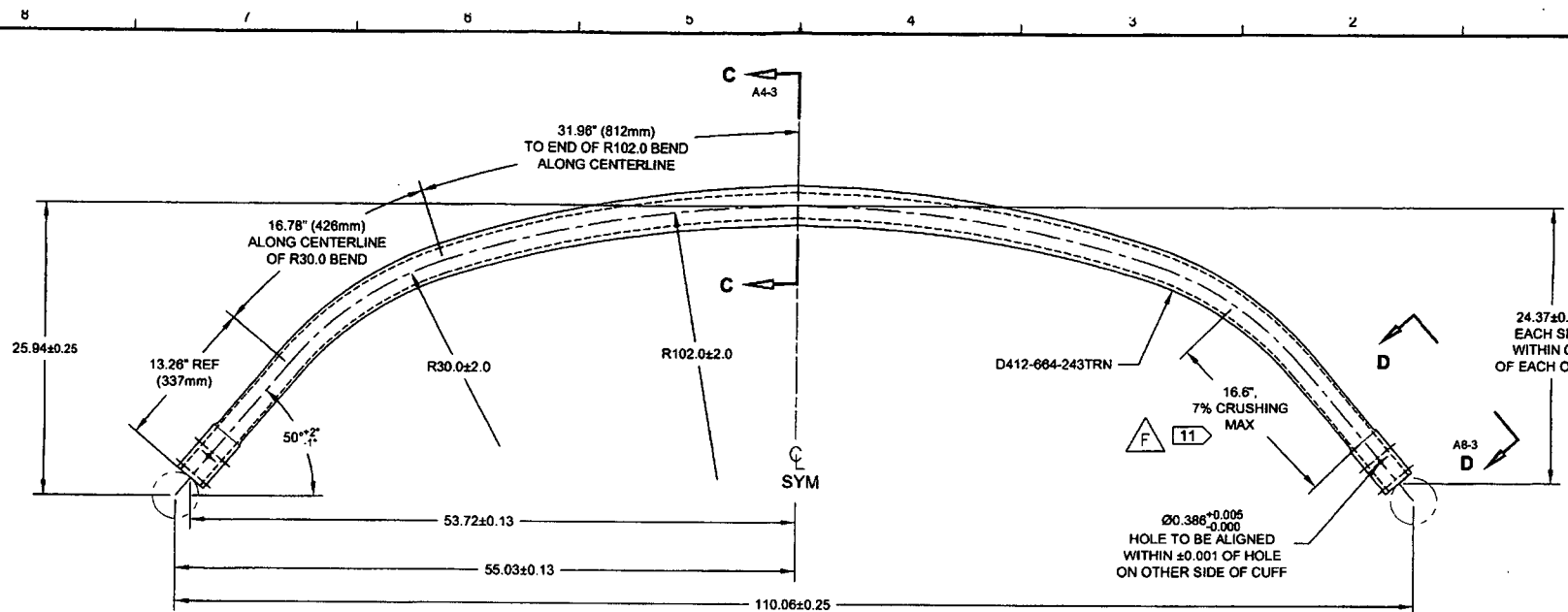
**SECTION B-B D4-2  
SCALE 4X**



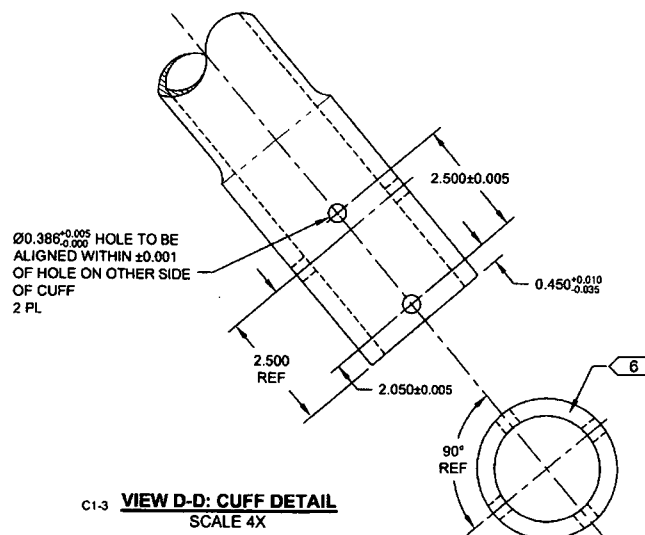
**SECTION A-A D6-2  
SCALE 6X**

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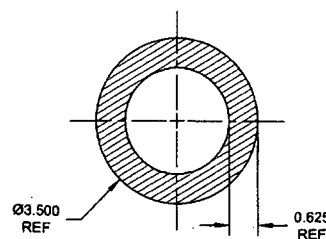
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DRAWN		HAWKESBURY, ONTARIO, CANADA	
CHECKED		DRAWING NO.	REV. F
MFG. APPR.		D412-664-243	SHEET 2 OF 4
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**D412-664-603**  
**BENDING AND DRILLING DETAIL**



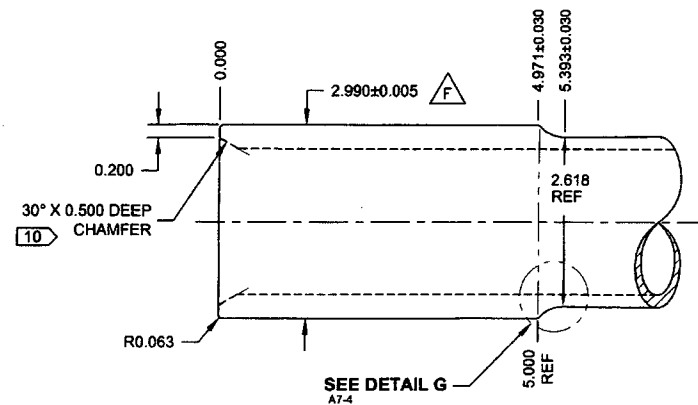
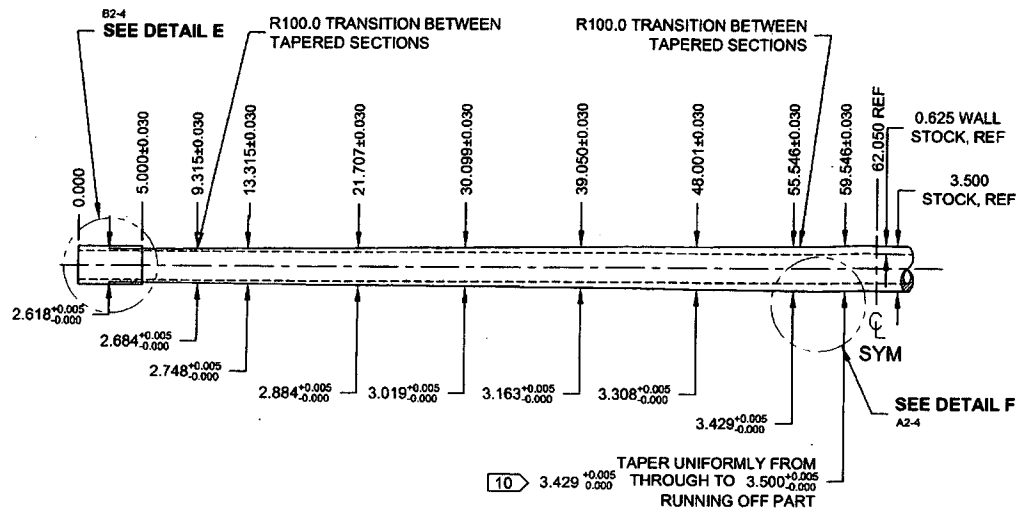
C1-3 **VIEW D-D: CUFF DETAIL**  
SCALE 4X



**SECTION C-C** D5-3  
SCALE 4X

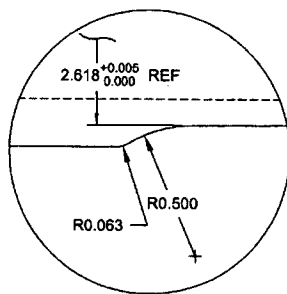
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2014-05-26

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CHECKED	DW	DRAWING NO.	REV. F
MFG. APPR.		D412-664-243	SHEET 3 OF 4
APPROVED	MD	TITLE	SCALE
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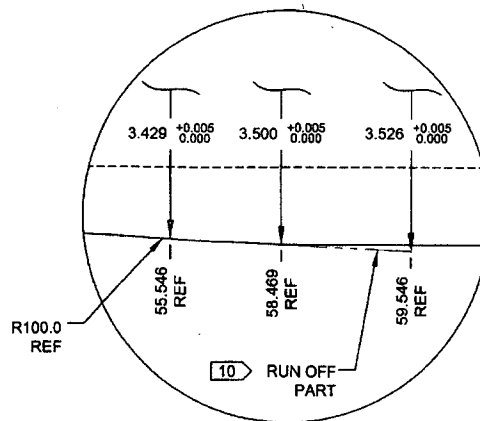


**D412-664-243TRN**  
**TURNING DETAIL**

**DETAIL E:**  
**CROSSTUBE CUFF**  
SCALE 5X



**DETAIL G:**  
**CUFF TRANSITION**  
SCALE 10X



**DETAIL F:**  
**TAPER RUN-OFF**  
NOT TO SCALE

**RELEASED**  
2014-05-26

DESIGN		<b>DART AEROSPACE LTD</b>
DRAWN		HAWKESBURY, ONTARIO, CANADA
CHECKED		DRAWING NO.
MFG. APPR.		D412-664-243
APPROVED		TITLE
DE APPR.		CROSSTUBE ASSEMBLY (412 HI AFT)
DATE	14.04.01	REV. F
		SHEET 4 OF 4
		SCALE
		NTS

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